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In re Patent Application of: Konstantin Aab et al. Atty Docket No. LMPY-15210 [289/U]

Application No.: 10/035,351 Filed: October 19, 2001 Confirmation No.: 2237

For: RESONATOR ARRANGEMENT FOR BANDWIDTH CONTROL

M/S APPEAL BRIEF PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmittal herewith is an amendment in the above-identified application.

The fee has been calculated as shown below.

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE
TOTAL	47	MINUS	47	0	x $18 =	$0
INDEP.	9	MINUS	9	0	x $86 =	$0
FIRST PRESENTATION OF MULTIPLE DEP CLAIMS					+ $290	$0
					TOTAL	$0

Small Entity 50% Filing Fee Reduction (if applicable) $0

* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.
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1. ☐ No additional fee is required.
2. ☒ A check in the for $330.00 is attached in full payment of Appeal Brief rule 37 CFR 1.17(c).
3. ☒ Please charge any additional fees, including any fees necessary for extensions of time or credit overpayment to Deposit Account No. 50-1703, under Order No. LMPY-15210.
A duplicate copy of this sheet is enclosed.
4. ☒ Petition for extension of time. The undersigned attorney of record hereby petitions for an extension of time pursuant to 37 C.F.R. § 1.136(a), as may be required, to file this response.

STALLMAN & POLLOCK LLP

Dated: August 6, 2004 By: [signature]
Jason D. Lohr (Reg. No. 48,163)
Attorneys for Applicant(s)

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 6, 2004.

Dated: August 6, 2004 By: Georgia K. Stith
Georgia K. Stith

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Konstantin Aab, et al.

Application No.: 10/035,351

Filed: October 19, 2001

For: RESONATOR ARRANGEMENT FOR BANDWIDTH CONTROL

Confirmation No.: 2237

Group Art Unit: 2828

Examiner: Hung T. Vy

APPEAL BRIEF

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STALLMAN & POLLOCK LLP

Dated: 08/6/2004 By: Georgia K. Stith
Georgia K. Stith

M/S APPEAL BRIEF PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a brief for an appeal from a Final Office Action mailed May 6, 2004, and in accordance with a Notice of Appeal mailed July 16, 2004. Three copies of this Appeal Brief are enclosed.

REAL PARTY IN INTEREST

The real party of interest is Lambda Physik, AG, pursuant to the assignment recorded in the PTO on April 3, 2002 at reel/frame 012787/0265.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences.

STATUS OF CLAIMS

Claims 1-47 were originally presented in the filing of the present application, Application No. 10/035,351. Claims 1-47 are pending. Claims 7, 9, 10, 13, 14, 17, 20, 23, 25, 27, 33, and 42 were Amended in a Response to a Non-Final Office Action (this Response was mailed on September 22, 2003). Claims 1-6, 8, 11-12, 15-16, 18-19, 21-22, 24, 26, 28-32, 34-41, and 43-47 are pending as originally filed. All pending claims are shown in the Appendix hereto.

STATUS OF AMENDMENTS

No amendments or responses were filed subsequent to the final rejection dated May 6, 2004.

EXAMINER INTERVIEW

A telephone interview was conducted with Examiner Hung T. Vy on July 13, 2004. During the course of the telephone interview, the present invention, the pending claims, and the *Algots* reference were generally discussed. No consensus or agreement was reached with respect to the pending claims. Examiner Vy asked that, for sake of clarity, the basic arguments be presented in this appeal brief to facilitate further understanding and consideration. Applicants appreciate the Examiner's helpful suggestion, and have included the appropriate arguments herein.

BRIEF SUMMARY

In the operation of laser systems it has been found that the wavelength and bandwidth of an output laser beam can vary depending on the operating conditions of the laser. Laser systems such as excimer laser systems can include a planar diffraction grating within the laser resonator cavity for providing wavelength dispersion and for narrowing the bandwidth of the laser oscillation. To increase the resolution of the grating, a beam expander can be used to reduce the beam divergence. Even when a beam expander is used, however, the wavefront of the beam that is incident upon the grating is generally non-planar. Such a non-linear or curved wavefront results in a broader spectral linewidth or bandwidth due to the fact that different portions of the

non-planar wavefront strike the grating at different angles. (See, e.g., patent app. p. 3, lines 9-23).

It is recognized in the present invention that the above-described problem can be addressed by providing an excimer or molecular fluorine laser resonator having wavefront compensation, such as by using an adjustable wavefront curvature correction device between the resonator mirrors, before the line-narrowing grating (or other dispersive element such as a prism or an interferometric device), so that the incoming beam wavefront substantially matches the surface of the grating when the wavefront is incident thereon (See, e.g., patent app. p. 3, lines 24-29).

In a number of embodiments, it was recognized that a bi-directional resonator arrangement for regulating and/or controlling the spectral bandwidth of an excimer or molecular fluorine laser system could utilize an output coupler as a first of a pair of resonator reflectors, and a dispersion element as a second of the pair of resonator reflectors. (See, e.g., patent app. p. 7 line 13-page 8, line 9). In order to control the bandwidth of the beam in the resonator, a folding or "deformable" mirror 4 can be positioned between the pair of resonator reflectors to provide wavefront compensation by adjusting the surface contour of the folding mirror to be more or less concave, for example. Placing the wavefront compensation between the resonator mirrors can improve the line-narrowing of the grating. The adjustable surface contour can be any of a number of appropriate shapes, such as cylindrical, spherical, aspherical, or toriqual surface contours. As such, the mirror preferably has an adjustable radius of curvature. The mirror also may have a convex or concave dome shape. The adjustability can be such that the surface contour of the folding mirror can be adjusted until the bandwidth is minimized. (See, e.g., patent app. p.8, lines 10-24).

In order to adjust the surface contour of the deformable mirror, a number of deforming devices can be used including those described in the present application. For example, a folding mirror can have an adjustable reflecting surface contour that includes one or more endplates coupled with and/or bonded to the folding mirror. An adjustable spindle or piezo transducer can be used along with a spring and a plate or wall to change the surface contour/concavity of the deformable folding mirror. (See, e.g., patent app. p.8, lines 22-31). When used with a bandwidth detector and processor in a feedback loop, the bandwidth can be actively controlled during laser

operation by continually and/or periodically adjusting the surface contour of the deformable mirror. (See, e.g., patent app. p.11, line 18-p. 12, line 2).

A driving element can be used to adjust the surface contour of the mirror. For example, a piezo transducer can be connected to the back of the mirror. The piezo can apply pressure to the center of the back of the mirror in an amount that depends on the electromagnetic energy supplied to the piezo by a control unit. Alternatively, multiple piezos can be disposed around the periphery of the back of the mirror. This control unit can receive bandwidth and other information, such as from a spectrometer and through a processor in a feedback arrangement. The control unit can control the piezo, spindle, or other surface contour adjusting device based on the bandwidth and/or linewidth information received from the spectrometer or processor. (See, e.g., patent app. p.12, lines 3-22).

ISSUES

One issue on appeal is whether claims 1-2, 5-17, 20-36, and 39-47 are unpatentable under 35 USC §102(e) as being anticipated by *Algots, et al.* (U.S. Patent No. 6,192,064).

Another issue on appeal is whether claims 3-4, 18-19, 37-38, and 43-44 are unpatentable under 35 USC §103(a) over *Algots*.

GROUPING OF THE CLAIMS

The claims can be considered generally in the following six groups, although patentable distinctions may exist within each individual group:

(1) The first group of claims includes claims 7-12, 13-16, and 23-24. These claims relate to a laser system including a third reflecting surface <u>disposed between the pair of resonator reflectors</u>, wherein the third surface is deformable such that <u>a surface contour of the third reflecting surface can be adjusted to control the bandwidth</u> of the laser beam.

(2) The second group of claims includes claims 27-32. These claims differ from group 1 in that the deformable third reflecting surface disposed between the pair of resonator reflectors is specified to have an adjustable surface contour <u>for matching the wavefront of the beam</u> to reduce the bandwidth.

(3) The third group of claims includes claims 1-6 and 17-22. These claims differ from group 1 in that the laser system includes a detector for detecting the bandwidth of the laser beam

and a processor for receiving a signal indicative of the bandwidth and controlling a surface contour of the deformable third reflecting surface to control the bandwidth in a feedback arrangement.

(4) The fourth group of claims includes claims 25-26. These claims differ from group 1 in that these claims recite a method of adjusting the bandwidth of a laser system including the steps of measuring a bandwidth of the laser beam and adjusting a surface contour of said deformable third reflecting surface for adjusting the bandwidth of the laser beam.

(5) The fifth group of claims includes claims 33-41. These claims differ from group 1 in that the reflecting surface disposed between the resonator reflectors is a bi-directional bandwidth controlled folding mirror assembly, wherein an adjustment spindle of the mirror assembly can be used to increase and decrease a concavity of a surface contour of the folding mirror.

(6) The sixth group of claims includes claims 42-47. These claims differ from group 1 in that the reflecting surface disposed between the resonator reflectors is a bi-directional bandwidth controlled folding mirror assembly, wherein a piezo transducer of the mirror assembly can be used to increase and decrease a concavity of a surface contour of the folding mirror.

ATTACHMENTS

Attached herewith please find an Appendix containing the claims involved in the present appeal.

ARGUMENT

(1) Anticipation rejection of Claims under the *Algots* reference:

Claims 1 – 2, 5-17, 20-36, and 39-47 stand rejected under 35 U.S.C. §102(e) as being anticipated by *Algots*.

In rejecting the claims under *Algots*, the Final Office Action recites a number of elements which are purportedly disclosed in the teaching of *Algots*. In order to focus the discussion and analysis herein, only specific elements of the pending claims and the teaching of *Algots* will be considered in detail; although it should be noted that this is not in fact a concession that all of the other elements recited in the claims are found in *Algots*.

In connection with the rejection under the *Algots*, the Final Office Action on p. 3 states that *Algots* discloses:

> **a deformable third reflecting surface disposed between the pair of resonator reflecting surfaces;**
> a detector for detecting the bandwidth of the laser beam; and
> a processor for receiving a signal indicative of said bandwidth from said detector and **controlling a surface contour of said deformable third reflecting surface to control said bandwidth** in a feedback arrangement.

(*emphasis and formatting added*). Portions of the above language from the Final Office Action have been highlighted to identify areas where there does not appear to be support for rejecting the pending claims.

Algots is directed to a system for fine laser control, wherein pulse energy is controlled by controlling the discharge voltage, wavelength is controlled by "very fine and rapid positioning of an R_{MAX} mirror," and bandwidth is controlled "by adjusting the curvature of a grating" (See e.g., Abstract; col. 2, lines 23-33). As described in *Algots*, it appears that the tiltable tuning mirror element is used for "fine wavelength control," and is not used to control bandwidth. Instead, the resonator grating is used to adjust bandwidth.

Algots discloses using an output coupler (4) as a first resonator mirror, and an adjustable grating (16) as a second resonator mirror, for forming a laser beam therebetween. The second resonator mirror, or grating, can be adjusted to "control bandwidth of the output beam" (col. 1, lines 27-62). *Algots* also utilizes an R_{MAX} mirror (14), or tuning mirror, between the resonator mirrors, whose tilt "determines the vertical angle of light reflecting in the resonance cavity," and whereby "wavelength selection is provided with stepper motor (15) setting the pivotal horizontal motion of tuning mirror (14)" (col. 4, lines 36-52). Stepper motor (15) can "pivot mirror (14) so that the wavelength is either increased or decreased to maintain the wavelength" at the desired wavelength (col. 6, line 65-col. 7, line 3). *Algots* uses the mirror to control wavelength, as the rapidly-adjustable mirror can easily be used to compensate for wavelength "chirp" as discussed elsewhere herein. As can be seen, *Algots* discloses using a separate adjustable grating as a bandwidth control, as well as a resonator mirror. A disadvantage to such a configuration is that it presently is relatively time consuming to adjust the curvature of a grating to control bandwidth.

The prior art device described with respect to Figure 1 includes a computer controller that "adjusts the pivot position of the tuning mirror (14) using stepper motor 15 in order to control the nominal wavelength of the beam to within desired limits" (See e.g., col. 2, lines 6-9). In the embodiments of Figures 2-9, an R_{MAX} tilt stepper motor (34) is used to tilt the tuning mirror (14) (See, e.g., Figs 2, 6(a)-6(d), and 9; col. 4, lines 36-52). The tuning mirror is tilted simply to

determine "the vertical angle of light reflecting in the resonance cavity" to provide "wavelength selection" with the tuning mirror (See, e.g., col. 2, lines 26-30; col. 3, line 18-col. 4, line 52; col. 4, lines 38-52). *Algots* teaches that a computer controller can be used to receive wavelength measurements from a wavelength monitor and use that information to "adjust stepper motor (15) to pivot mirror (14) so that the wavelength is either increased or decreased to maintain the wavelength" (See, e.g., col. 6, line 65-col. 7, line 3). For finer wavelength control, a stepper motor can be used to pivot a mirror mechanism which includes "a piezo-electric actuator (14B) configured to pivot turning mirror 14C with one degree of rotary motion" in accordance with another embodiment (See, e.g., col. 7, lines 8-15). This fine control over wavelength using the tuning mirror can be used "to compensate for distortions in the wavelength" or "wavelength chirp" due to thermal and other effects" (See, e.g., col. 8, lines 32-63).

Algots describes a segmented tuning mirror having five individual, discontinuous planar mirror segments, wherein each planar segment has an associated tilt control used to tilt each mirror segment in a particular direction in order to direct the beam (See e.g., col. 9, lines 1-13). This tilting mirror is positioned between the ends of the resonator. When these mirror segments are aligned in a plane, the segments form a planar mirror. When the segments are each tilted in the same direction, but at an angle relative to the plane of the pivot points, the segments do not form a surface contour at all, but instead form a discontinuous set of planar surfaces. As such, these mirror segments cannot be used to form a surface contour. Even if the mirror segments are each tilted at different angles, of which there is no teaching or suggestion in *Algots*, the segments still would form a discontinuous set of planar segments. Further, as discussed in more detail below, these planar mirrors are used to adjust the wavelength, not the bandwidth.

Each of these mirror segments can be pointed at the "required angle" by an individual piezo-electric driver in order to obtain the proper reflection angle for each portion of the laser beam. (See, e.g., col. 9, lines 1-13). The advantage to using a segmented mirror instead of a single mirror to obtain the proper reflection angle is that "individual segmented mirrors are much lighter" and "much faster control [is] possible" than in the embodiments of Figures 9 and 11, such that the wavelength can be maintained with more precision (See, e.g., col. 7, lines 8-29; col. 8, line 31-col. 9, line 13). The ability to quickly and precisely control wavelength can minimize the effects of "chirp." (See, e.g., col. 8, lines 33-63)

Algots does not disclose, teach, or suggest that the tuning mirror of *Algots* can be used to control the bandwidth of the laser system. In fact, *Algots* uses a separate deformable grating (16) to control bandwidth (See, e.g., col. 3, line 19-col. 4, line 28). This grating is not disposed between the ends of the resonator, but instead forms an end of the resonator cavity. If the tuning mirror of *Algots* were able to control bandwidth in addition to wavelength, there would be no reason to include the control mechanism for the grating, which likely increases design complexity, cost, and maintenance. Further, the process of controlling and adjusting the shape of a grating would appear to be relatively slow, and would not allow for real-time adjustment of the bandwidth with the accuracy and precision of embodiments of the present invention, such that if the rapid tuning mirror of *Algots* could be used to control bandwidth, it would actually be a disadvantage to use the adjustable grating of *Algots*. Since *Algots* does in fact use the separate resonator grating to control the bandwidth, it follows that the rapid tuning mirror of *Algots* cannot be used to control bandwidth, or, in the alternative, that it was at least not obvious to do so, or obvious that the tuning mirror could be used to control bandwidth with any likelihood of success.

Further, there is no teaching or suggestion of how the tuning mirror of *Algots*, whether a plane or segmented planar mirror, could be used to control the bandwidth of the system. A plane mirror or plane mirror segment only can adjust the direction of the beam incident on that mirror or segment. If the mirror is simply segmented, the pivot points of the mirrors would still lie in a single plane, and there is no teaching or suggestion of how these plates then could be used to compensate for an irregular laser beam wavefront in order to control the bandwidth of the beam.

It is respectfully submitted that the *Algots* reference clearly does not disclose controlling a surface contour of a reflecting mirror positioned between the resonator mirrors in order to control the bandwidth of the laser beam. Further, it is respectfully submitted that *Algots* does not appear to contain any suggestion that the bandwidth can be controlled by a deformable mirror. Instead, *Algots* teaches a system that controls the bandwidth using a separate, adjustable grating element and does not use the tuning mirror for anything other than wavelength tuning.

Applicants respectfully disagree with some of the conclusions in the Final Office Action of May 6, 2004. For example, on page 3, the Final Office Action states that *Algots* discloses "controlling a surface contour of aid deformable third reflecting surface to control said bandwidth in a feedback arrangement" (See, e.g., col. 4, line 64-68 and col. 5, line 1-11). It is

respectfully submitted that the language cited by the Examiner discusses beam parameters, but does not in fact disclose anything about controlling a surface contour of a deformable third reflecting surface in order to control bandwidth in a feedback arrangement. In fact, as discussed above *Algots* discloses using a resonator grating to control bandwidth and uses the tunable mirror to control wavelength. Similarly, at the bottom of page 7/top of page 8 the Final Office Action states "*Algots* does have a controllable surface contour capable of controlling the bandwidth of the laser beam (See, e.g., col. 2, line 21-39)." It is respectfully submitted that the language cited by the Examiner instead *explicitly states* that it is the wavelength that "is controlled by very fine and rapid positioning of an R_{MAX} mirror" and the bandwidth is instead controlled "by adjusting the curvature of a grating" (See e.g., col. 2, lines 25-30).

Each of the independent claims of the present application recites some element(s) related to controlling the bandwidth of the laser system by controlling a surface contour of a deformable reflecting mirror positioned between the resonator mirrors. For ease of reference, excerpts of each of the independent claims relating to controlling the bandwidth of the laser system by controlling a surface contour of a deformable reflecting mirror are shown below, and it is respectfully submitted that this utilization clearly does not appear to be disclosed, taught, or suggested in *Algots*.

Group 1

The claims in group 1 require a deformable third reflecting surface disposed between the pair of resonator reflector surfaces, where the deformable third reflecting surface has a surface contour that can be adjusted to control the bandwidth of the laser beam.

Claim 7 recites in part: "a third reflecting surface disposed between the pair of resonator reflector surfaces, the third reflecting surface being deformable such that a surface contour of the third reflecting surface can be adjusted to control the bandwidth of the laser beam."

Claim 13 recites in part: "a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour which is deformable in order to control the bandwidth of the laser beam."

Claim 23 recites in part: "a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour that can be modified to control the bandwidth of the laser beam."

Group 2

The claims in group 2 require the deformable third reflecting surface to have a surface contour that is adjustable to match the wavefront of the laser beam, in order to reduce the bandwidth. The planar tuning mirror of *Algots* cannot be adjusted to match the wavefront of the laser beam, and there is no disclosure, teaching, or suggestion that a discontinuous array of planar tuning mirror segments, particularly those constrained to have pivot points lying in the same plane, can be manipulated to match the wavefront of the laser beam.

Claim 27 recites in part: "a deformable third reflecting surface disposed between the pair of resonator reflectors having an adjustable surface contour for matching the wavefront of the beam to reduce the bandwidth narrowed/selected by the line-narrowing/selection unit."

Group 3

The claims in group 3 include a processor for use in controlling the surface contour of the third reflecting surface in order to control the bandwidth. As discussed above, the third reflecting surface in *Algots* is not used to control bandwidth, and it is not suggested that the reflecting surface can be used to control bandwidth. Further, the third reflecting surface in *Algots* does not have a deformable surface contour, but instead utilizes a planar mirror or a discontinuous array of planar mirror segments. *Algots* does not disclose a processor for controlling a surface contour of said deformable third reflecting surface to control said bandwidth. Since *Algots* does not disclose any of these limitations, it follows that *Algots* does not teach or suggest that the "computer controller" (e.g., col. 4, line 64-col. 5, line 20) or any other processing means of *Algots* can be used to control bandwidth by controlling a surface contour of the deformable third reflecting surface.

Claim 1 recites in part: "a deformable third reflecting surface disposed between the pair of resonator reflecting surfaces" and "a processor" for "controlling a surface contour of said deformable third reflecting surface to control said bandwidth in a feedback arrangement."

Claim 17 recites in part: "a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour which is deformable" and "a processor" for "controlling a surface contour of said deformable third reflecting surface in a feedback arrangement in order to control at least the bandwidth of the laser beam."

Group 4

The claims in group 4 are method claims, which include the limitation to adjusting a surface contour of the deformable third reflecting surface in order to adjust the bandwidth of the laser beam. As discussed above, the third reflecting surface in *Algots* is not used to control bandwidth, and it is not suggested that the reflecting surface can be used to control bandwidth. Further, the third reflecting surface in *Algots* does not have a deformable surface contour, but instead utilizes a planar mirror or a discontinuous array of planar mirror segments.

Claim 25 recites in part: "a deformable third reflecting surface disposed between the pair of resonator reflectors" and "adjusting a surface contour of said deformable third reflecting surface for adjusting the bandwidth of the laser beam based on the measured bandwidth."

Group 5

The claims in group 5 recite structure of a folding mirror assembly that is not found in *Algots*, particularly an adjustment spindle that can be used to increase and/or decrease the concavity of a surface contour of the folding mirror for bi-directional bandwidth control. The nature of the *Algots* tuning mirror, which is either a plane mirror or a discontinuous array of planar segments confined to have their pivot points in a single plane, is such that the *Algots* tuning mirror cannot change concavity.

Claim 33 recites in part: "a bi-directional bandwidth controlled folding mirror assembly disposed between the pair of resonator reflectors" including a "folding mirror", "a coupling plate coupling with the mirror," "an adjustment spindle penetrating through a cavity defined in the coupling plate," and "wherein screwing the adjustment spindle in a first direction increases a concavity of a surface contour of the folding mirror, and screwing the adjustment spindle in a second direction opposite to said first direction decreases the concavity of the surface contour of the folding mirror."

Group 6

The claims of group 6 recite structure of a folding mirror assembly that is not found in *Algots*, particularly a piezo transducer that can be used to increase and/or decrease the concavity of a surface contour of the folding mirror for bi-directional bandwidth control. The nature of the *Algots* tuning mirror, which is either a plane mirror or a discontinuous array of planar segments confined to have their pivot points in a single plane, is such that the *Algots* tuning mirror cannot change concavity.

Claim 42 recites in part: "a bi-directional bandwidth controlled folding mirror assembly disposed between the pair of resonator reflectors" including a "folding mirror", "a coupling plate coupling with the mirror," "a piezo transducer coupled with the coupling plate," and "wherein operating the piezo transducer in a first direction increases a concavity of a surface contour of the folding mirror, and operating the piezo transducer in a second direction opposite to said first direction decreases the concavity of the surface contour of the folding mirror."

Dependent claims

Claims 2, 5-6, 8-12, 14-16, 20-22, 24, 26, 28-32, 34-36, 39-41, and 43-47 depend from the above-referenced independent claims. Although each of these dependent claims may recite additional limitations that are patentable over *Algots*, each of these dependent claims should not be anticipated by *Algots* as each of these claims depends from an independent claim that is not anticipated by *Algots* as discussed above.

(2) Obviousness rejection of Claims under the *Algots* reference:

Claims 3-4, 18-19, 37-38, and 43-44 stand rejected under 35 U.S.C. §103(a) as being rendered obvious in light of *Algots*.

In regard to claims 3-4, 18-19, 37-38, and 43-44, the Final Office Action states in part on p. 5:

> *Algots* discloses the claimed invention except for different the deformable third reflecting surface as cynlindrical, spherical, convex, or concave mirror. It would have been obvious to one having ordinary skill in the art at the time the invention was made to different [sic] the deformable third reflecting surface, since it has been held to be within general skill of a worker in the art to select a known material **on the basis of its suitability for the intended use** as a matter of obvious design choice

(*emphasis and formatting added*). It is respectfully submitted that a review of *Algots* fails to support aspects of the above statement from the Final Office Action. Each of claims 3-4, 18-19, 37-38, and 43-44 depend from one of the independent claims discussed above, which are not rendered obvious by *Algots* for reasons including those discussed above. In addition, however, Applicants respectfully submit that a third reflecting surface being a "cylindrical, spherical, convex, or concave mirror" would in fact *not* be an "obvious design choice" as stated in the Final Office Action, as none of these options would be suitable "for the intended use" in *Algots*. As discussed above, the tiltable tuning mirror of *Algots* is used for "fine wavelength control" (See, e.g., Abstract; col. 2, lines 23-33) by adjusting "the pivot position of the tuning mirror (14) using stepper motor 15 in order to control the nominal wavelength of the beam to within desired limits" (See, e.g., col. 2, lines 6-9; Figs. 6(a)-6(d), and 9; col. 4, lines 36-52). The tuning mirror is tilted simply to determine "the vertical angle of light reflecting in the resonance cavity" to provide "wavelength selection" with the tuning mirror (See, e.g., col. 2, lines 26-30; col. 3, line 18-col. 4, line 52; col. 4, lines 38-52). The planar mirror of *Algots*, or each of the discontinuous planar mirror segments, needs to be pointed at the "required angle" by an individual piezo-electric driver in order to obtain the proper reflection angle for each portion of the laser beam (See, e.g., col. 9, lines 1-13). Using a "cylindrical, spherical, convex, or concave mirror" would not be suitable for such use, as each portion of the beam hitting a different portion of the "cylindrical, spherical, convex, or concave mirror" would be reflected in a different direction, at a different angle, such that the majority of the beam would not have the proper reflection angle when hitting the grating, and therefore would not provide proper wavelength selection. Therefore, not only is there no teaching or suggestion that the tiltable tuning mirror of *Algots* could be a "cylindrical, spherical, convex, or concave mirror" as stated in the Final Office Action on page 5, but such a mirror would not work for the intended use of wavelength selection in *Algots*. As such, the additional limitations of claims 3-4, 18-19, 37-38, and 43-44 should render these claims non-obvious in light of *Algots*.

CONCLUSION

For the reasons set forth above, Applicant respectfully submits that the claims 1-47 are neither anticipated nor rendered obvious by the *Algots* reference, and a holding to that end by the Board is respectfully requested.

Respectfully submitted,

STALLMAN & POLLOCK LLP

Dated: August 3, 2004

By: ______________________

Jason D. Lohr
Reg. No. 48,163

Attorneys for Applicant(s)

Listing of Claims:

1. (Original) An excimer or molecular fluorine laser system, comprising:

a discharge chamber filled with a gas mixture at least including molecular fluorine and a buffer gas;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture;

a resonator including a pair of resonator reflecting surfaces disposed on either side of the discharge chamber for generating a laser beam, said resonator further including a deformable third reflecting surface disposed between the pair of resonator reflecting surfaces;

a line-narrowing/selection unit within the resonator for narrowing the bandwidth of the laser beam;

a detector for detecting the bandwidth of the laser beam; and

a processor for receiving a signal indicative of said bandwidth from said detector and controlling a surface contour of said deformable third reflecting surface to control said bandwidth in a feedback arrangement.

2. (Original) The laser system of Claim 1, wherein said deformable third reflecting surface is a highly reflective mirror.

3. (Original) The laser system of Claim 1, wherein said deformable third reflecting surface is a cylindrical mirror.

4. (Original) The laser system of Claim 1, wherein said deformable third reflecting surface is a spherical mirror.

5. (Original) The laser system of Claim 1, wherein said line-narrowing/selection unit includes a beam expander and dispersive element, and wherein said deformable third reflecting surface is disposed between said beam expander and said dispersive element.

6. (Original) The laser system of Claim 1, wherein said line-narrowing/selection unit includes a dispersive element, and wherein said deformable third reflecting surface is disposed just before said dispersive element.

7. (Previously Presented) A line-narrowed excimer or molecular fluorine laser system, comprising:

a discharge chamber filled with a gas mixture at least including molecular fluorine and a buffer gas;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture;

a resonator including a pair of resonator reflecting surfaces disposed on either side of the discharge chamber for generating a laser beam; and

a third reflecting surface disposed between the pair of resonator reflector surfaces, the third reflecting surface being deformable such that a surface contour of the third reflecting surface can be adjusted to control the bandwidth of the laser beam.

8. (Original) The laser system of Claim 7, further comprising deformation means for controllably adjusting the surface contour of said deformable third reflecting surface.

9. (Previously Presented) The laser system of Claim 7, further comprising a line-narrowing/selection unit including a beam expander and dispersive element, and wherein said deformable third reflecting surface is disposed between said beam expander and said dispersive element.

10. (Previously Presented) The laser system of Claim 7, further comprising a line-narrowing/selection unit including a dispersive element, and wherein said deformable third reflecting surface is disposed just before said dispersive element.

11. (Original) The laser system of Claim 7, further comprising a processor for automatically adjusting the bandwidth of said laser by sending a signal to adjust said surface contour.

12. (Original) The laser system of Claim 11, further comprising a detector for detecting the bandwidth of the laser system and communicating bandwidth information to the processor which controls said bandwidth in a feedback arrangement.

13. (Previously Presented) A line-narrowed excimer or molecular fluorine laser system, comprising:

a discharge chamber filled with a gas mixture at least including molecular fluorine and a buffer gas;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture;

a resonator including a pair of resonator reflecting surfaces disposed on either side of the discharge chamber for generating a laser beam, said resonator further including a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour which is deformable in order to control the bandwidth of the laser beam;

a line-narrowing/selection unit within the resonator for narrowing the bandwidth of the laser beam; and

a spectrometer for measuring the bandwidth of said laser beam.

14. (Previously Presented) The laser system of Claim 13, further comprising a processor for receiving data from the spectrometer corresponding to a current bandwidth and for outputting a signal to adjust the surface contour of the deformable third reflecting surface corresponding to a desired bandwidth.

15. (Original) The laser system of Claim 13, wherein said line-narrowing/selection unit includes a beam expander and dispersive element, and wherein said deformable third reflecting surface is disposed between said beam expander and said dispersive element.

16. (Original) The laser system of Claim 13, wherein said line-narrowing/selection unit includes a dispersive element, and wherein said deformable third reflecting surface is disposed just before said dispersive element.

17. (Previously Presented) A line-narrowed excimer or molecular fluorine laser system, comprising:

a discharge chamber filled with a gas mixture at least including molecular fluorine and a buffer gas;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture;

a resonator including a pair of resonator reflecting surfaces disposed on either side of the discharge chamber for generating a laser beam, said resonator further including a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour which is deformable;

a line-narrowing/selection unit within the resonator for narrowing the bandwidth of the laser beam; and

a detector for detecting at least one parameter of the laser system including the bandwidth of the laser beam; and

a processor for receiving a signal indicative of said at least one laser system parameter from said detector and controlling a surface contour of said deformable third reflecting surface in a feedback arrangement in order to control at least the bandwidth of the laser beam.

18. (Original) The laser system of Claim 17, wherein said deformable third reflecting surface is a cylindrical mirror.

19. (Original) The laser system of Claim 17, wherein said deformable third reflecting surface includes a curvature in two orthogonal cross-sectional beam axis directions.

20. (Previously Presented) The laser system of Claim 17, wherein said laser system parameter is laser beam linewidth.

21. (Original) The laser system of Claim 17, wherein said line-narrowing/selection unit includes a beam expander and dispersive element, and wherein said deformable third reflecting surface is disposed between said beam expander and said dispersive element.

22. (Original) The laser system of Claim 17, wherein said line-narrowing/selection unit includes a dispersive element, and wherein said deformable third reflecting surface is disposed just before said dispersive element.

23. (Previously Presented) A line-narrowed excimer or molecular fluorine laser system, comprising:

a discharge chamber filled with a gas mixture at least including molecular fluorine and a buffer gas;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture;

a resonator including a pair of resonator reflecting surfaces disposed on either side of the discharge chamber for generating a laser beam, said resonator further including a third reflecting surface disposed between the pair of resonator reflecting surfaces and having a surface contour that can be modified to control the bandwidth of the laser beam;

a line-narrowing/selection unit within the resonator for narrowing the bandwidth of the laser beam, and

wherein said line-narrowing/selection unit includes a dispersive element, and wherein said deformable third reflecting surface is disposed just before said dispersive element.

24. (Original) The laser system of Claim 23, wherein said line-narrowing/selection unit further includes a beam expander, and wherein said deformable third reflecting surface is disposed between said beam expander and said dispersive element.

25. (Previously Presented) A method of adjusting the bandwidth of a line-narrowed excimer or molecular fluorine laser including a discharge chamber having a gas mixture and a

plurality of electrodes therein within a resonator for generating a laser beam, the resonator including a pair of resonator reflectors disposed on either side of the discharge chamber for generating a laser beam and a deformable third reflecting surface disposed between the pair of resonator reflectors, comprising the operations:

applying electrical pulses to the plurality of electrodes within said discharge chamber for energizing the gas mixture therein;

measuring a bandwidth of the laser beam; and

adjusting a surface contour of said deformable third reflecting surface for adjusting the bandwidth of the laser beam based on the measured bandwidth.

26. (Original) The method of Claim 25, further comprising the operations transmitting a signal to a processor corresponding to the measured bandwidth, and transmitting another signal to the deformable third reflecting surface corresponding to a selected surface contour adjustment.

27. (Previously Presented) An excimer or molecular fluorine laser, comprising:

a discharge chamber filled with a gas mixture;

a plurality of electrodes in the discharge chamber connected to a pulse power circuit for energizing the gas mixture; and

a resonator for generating a laser beam, including one or more line-narrowing/selection optics, a pair of resonator reflectors and a deformable third reflecting surface disposed between the pair of resonator reflectors having an adjustable surface contour for matching the wavefront of the beam to reduce the bandwidth narrowed/selected by the line-narrowing/selection unit.

28. (Original) The laser of Claim 27, wherein the one or more line-narrowing/selection optics include a dispersive element, and wherein the deformable third reflecting surface is disposed just before the dispersive element.

29. (Original) The laser of Claim 28, wherein the one or more line-narrowing/selection optics include a beam expander, and wherein the deformable third reflecting surface is disposed between the beam expander and the dispersive element.

30. (Original) The laser of Claim 29, wherein the dispersive element is a grating serving as one of said pair of resonator reflectors.

31. (Original) The laser of claim 28, the resonator further comprising an interferometric device.

32. (Original) The laser of claim 27, wherein the adjustable surface contour of the deformable third reflecting surface is automatically feedback controlled using a processor and a detector for monitoring a spectral parameter of the laser beam.

33. (Previously Presented) A resonator for an excimer or molecular fluorine laser system, comprising:

a discharge chamber for filling with a gas mixture;

a plurality of electrodes within the discharge chamber for connecting to a discharge circuit for energizing the gas mixture;

a pair of resonator reflectors for generating a laser beam; and

a bi-directional bandwidth controlled folding mirror assembly disposed between the pair of resonator reflectors, the mirror assembly including:

a folding mirror;

a coupling plate coupling with the mirror;

an adjustment spindle penetrating through a cavity defined in the coupling plate, and

wherein screwing the adjustment spindle in a first direction increases a concavity of a surface contour of the folding mirror, and screwing the adjustment spindle in a second direction opposite to said first direction decreases the concavity of the surface contour of the folding mirror.

34. (Original) The resonator of Claim 33, further comprising at least one spring disposed between a portion of said coupling plate and a head of said adjustment spindle.

35. (Original) The resonator of Claim 33, further comprising a movable nut on the adjustment spindle.

36. (Original) The resonator of Claim 33, further comprising a motor for motorizing the adjustment spindle.

37. (Original) The resonator of Claim 33, wherein the surface contour of the folding mirror is convex.

38. (Original) The resonator of Claim 33, wherein the surface contour of the folding mirror is concave.

39. (Original) The resonator of Claim 33, further comprising a line narrowing/selection unit including at least one optical element having an adjustable orientation for tuning a wavelength of the laser beam, and wherein said adjusting of said surface contour of said folding mirror adjusts the bandwidth of the laser beam.

40. (Original) The resonator of Claim 39, wherein the line narrowing/selection unit includes a beam expander and a dispersive element, and wherein the folding mirror is disposed between the beam expander and the dispersive element.

41. (Original) The resonator of Claim 33, wherein the bi-directional bandwidth controlled folding mirror assembly is configured such that the surface contour of the folding mirror is adjustable based on signals received from a detector for monitoring the bandwidth of the laser beam.

42. (Previously Presented) A resonator for an excimer or molecular fluorine laser system, comprising:

a discharge chamber for filling with a gas mixture;

a plurality of electrodes within the discharge chamber for connecting to a discharge circuit for energizing the gas mixture;

a pair of resonator reflectors for generating a laser beam; and

a bi-directional bandwidth controlled folding mirror assembly disposed between the pair of resonator reflectors, the mirror assembly including:

a folding mirror;

a coupling plate coupling with the mirror;

a piezo transducer coupled with the coupling plate, and

wherein operating the piezo transducer in a first direction increases a concavity of the folding mirror, and operating the piezo transducer in a second direction opposite to said first direction decreases a concavity of the folding mirror.

43. (Original) The assembly of Claim 42, wherein the folding mirror is convex.

44. (Original) The assembly of Claim 42, wherein the folding mirror is concave.

45. (Original) The resonator of Claim 42, further comprising a line narrowing/selection unit including at least one optical element having an adjustable orientation for tuning a wavelength of the laser beam, and wherein said adjusting of said surface contour of said folding mirror adjusts the bandwidth of the laser beam.

46. (Original) The resonator of Claim 42, wherein the line narrowing/selection unit includes a beam expander and a dispersive element, and wherein the folding mirror is disposed between the beam expander and the dispersive element.

47. (Original) The resonator of Claim 42, wherein the bi-directional bandwidth controlled folding mirror assembly is configured such that the surface contour of the folding mirror is adjustable based on signals received from a detector for monitoring the bandwidth of the laser beam.